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Implementing Multimedia Teaching to Improve Students' Motivation and Critical Thinking Skills based on The Students' Learning Styles at Mahatma Gading School

Usha Naraindas Bharwani
Sekolah Mahatma Gading, Indonesia
hitara88@gmail.com

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A B S T R A C T

This study investigated implementing multimedia teaching to improve students' motivation and critical thinking skills based on students learning styles at Mahatma Gading School. Multimedia learning offers a significant opportunity to reach the greatest number of students and most effectively supports students with different learning styles. The study employed quantitative weak experimental of static group pre-test post-test. The respondents were 67 students from Mahatma Gading School academic year 2016. There was no control group. The data was computed using SPSS VERSION 22. Results of the pretest were observed before teaching and results of the posttest was conducted after teaching. Instruments used for data collection were in the form of test and questionnaire. The test was to measure students' critical thinking skills and questionnaire to measure students learning styles and motivation. The researcher analyzed the data through Descriptive Statistics, and Wilcoxon Test. The data was then analyzed, which showed there was a statistically significant difference between students after implementing multimedia during the Science class. However, the result of the Wilcoxon Test on reading learners had no significant differences in students learning styles.

BACKGROUND OF THE STUDY

In today's culture and society students lack understanding of the importance of education. According to Erdemir (2011) one of the major reasons students do not understand its importance is because students have begun to dislike the teaching methods of educations. Arifah and Norizan (2008) mentioned that students respond to information differently, thus, teachers can take this advantage by using many different formats and modes to teach, such as combination of lecture, text and hands-on laboratory to convey information. Students are more familiar with their expensive gadgets like the telephone, laptops with wireless internet, television, games. According to Teoh and Neo (2007), teachers that teach science with multimedia make science classes more active and interesting than common models. Studies about learning show that considering students learning styles in planning and presenting education can improve learning process meaningfully (Ghaedi & Jam, 2014).

Multimedia courseware is one of the solutions in dealing with students' differences in their learning styles and knowledge background, since it integrates media element can engage human information retrieval methods which are visual, auditory, reading and kinesthetic (Noordin, Ahmad, & Hooi, 2011). A cognitive theory of multimedia learning based on three main assumptions: there are two separate channels (auditory and visual) for processing information; there is limited channel capacity; and that learning is an active process of filtering, selecting, organizing, and integrating information (Mayer, 2005).

According to Schunk (1991), the use of power point in teaching will direct, energize, gets student moving, and points them in particular directions. Students motivated to learn about a topic are apt to engage in activities. Students who are intrinsically motivated may engage in an activity because it gives them pleasure, helps them develop a skill they think is important.

Hepner (2011) said that every student comes from different backgrounds. Some of them may not have their critical thinking skills developed. As a result, students are unable to answer open ended. However, they are more comfortable to answer the multiple choice questions answers instantly in an easy way.

This is why this research has chosen the implementing multimedia teaching to improve students' motivation and critical thinking skills based on students learning styles at Mahatma Gading School. The objectives of this study are firstly, to investigate the implementing of multimedia teaching to improve students' motivation in pre-test and post-test based on students learning styles for Grade VIII at Mahatma Gading School. Secondly, to investigate the implementing of multimedia teaching to improve students' critical thinking skills in pre-test and post-test based on students learning styles for Grade VIII at Mahatma Gading School.

LITERATURE REVIEW

Multimedia and Its Advantages

Mayer (2005) mentioned people learn better from words and pictures than from words alone. In this context, words include written and spoken texts, and pictures include static graphic images, animation and video. The words can be spoken or written, and the pictures can be any form of graphical imagery including illustrations, photos, animation, or video. Kearsley in Teoh and Neo (2007) mentioned imagery pictures have been shown to facilitate recall in many studies. There are five forms of representation of words and pictures that occur as information processed by memory (Mayer in Sorden, 2012). Each form represents a particular stage of processing in the three-memory stores model of multimedia learning. The first form of representation is the words and pictures in the multimedia presentation itself. The second form is the acoustic representation (sounds) and iconic representation (images) in sensory

memory. The third form is the sounds and images in working memory. The fourth form of representation is the verbal and pictorial model, which is also found in working memory. The fifth form is prior knowledge, or schemas, which are stored in long-term memory. Ding and Liu (2012) mentioned the advantages of power point are i) producing better visual effects and deeper impression, ii) speeding up the information transfer, iii) more precise and more systematic.

Learning Styles

Surjono (2015) mentioned learning styles can be defined as the complex manner in which learners most efficiently and effectively perceive, process, store, recall what they are trying to learn which adopt a habitual and distinct mode of acquiring knowledge. It is the attitudes and behaviors, which determine an individual's preferred way of learning. Marcy (2001) mentioned learning styles is a term used that refer to the methods of gathering, processing, interpreting, organizing and thinking about information. Fleming in Hawk & Shah (2007) defines learning style as "an individual's characteristics and preferred ways of gathering, organizing, and thinking about information. Visual, auditory, reading and kinesthetic is the category of instructional preference because it deals with perceptual modes, or senses which does not address, taste and smell.

Table 1. Activities in VARK Learning Style

Visual	Aural	Read or Write	Kinesthetic
Diagrams	Debates,	Books, Texts	Real – Life
Graphs	Arguments	Handouts	Examples
Colours	Discussions	Reading	Examples
Chars	Conversations	Written Feedback	Guest Lecturers
Written Texts	Audio Tapes	Note Taking	Demonstrations
Different Fonts	Video + Audio	Essays	Physical Activity
Spatial Arrangement	Seminars	Multiple Choice	Construction
Designs	Music	Bibliographies	Role Play
	Drama		Working Models

Source: Fleming in Hawk & Shah (2007)

Dunn and Griggs (2000) mentioned learning style is the way in which each learner begins to concentrate on, process, absorb, and retain new and difficult information. The five key dimensions on which student learning styles differed they are reactions to the immediate instructional: 1) environment; 2) emotional; 3) sociological preferences; 4) physiological characteristics; and 5) psychological global versus analytic processing as determined through correlations among sound, light, design, persistence, sociological preference, and intake.

Motivation

Gottfried (1990) in Lai (2011) mentioned academic motivation is an enjoyment of school learning characterized by a mastery orientation; curiosity; persistence; and the learning of challenging, difficult, and novel tasks. According to Moss and Brookhart (2012), learners in cognitive, affective and psychomotor can be seen from their change in 1) knowledge, 2) understanding, 3) habits 4) skills, 5) appreciation, 6) emotional 7) relationship social, 8) physical, 9) ethical or moral and 10) attitude.

Santrock (2008) mentioned extrinsic motivation is motivation that arises because of the support of the extrinsic aspect, which comes from outside the student who can shape the form of awards, comfortable learning environment and fun, and exciting learning method.

Csikszemtmihalyi (1990) in Dörnyei and Ushioda (2011) mentioned three components to develop students' motivation are importance, interest and utility.

Critical Thinking Skills

In this Ennis concept, decision-making is part of critical thinking skills. Edward Glaser defines critical thinking in Fisher (2009) as: 1) an attitude where a person wants to think deeply about the issues - the problems and things - things that are within the reach of the person's experience; 2) Knowledge of methods of examination and logical reasoning; 3) a kind of a skill for applying the method. Critical thinking is reflective thinking and productive that involves the evaluation of the evidence (Santrock, 2008). Bloom Taxonomy (1984) mentioned the main domain in Bloom Taxonomy are Cognitive, Affective, and Psychomotor. The indicators of Bloom's Taxonomy are:

1. remembering;
2. understanding;
3. applying;
4. analyzing;
5. evaluating;
6. creating.

Theoretical Framework

Multimedia is the independent variable and the dependent variables are motivation and critical thinking skills in the research. Learning styles is the intervening between multimedia, critical thinking and motivation.
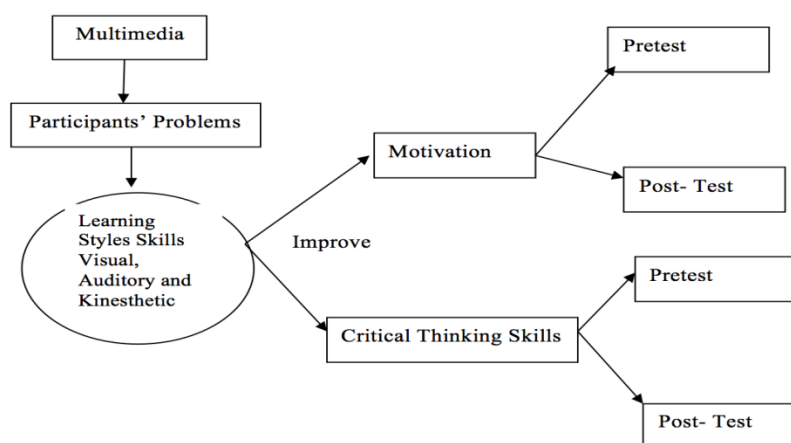

Figure 1.
Theoretical Framework

RESEARCH METHODOLOGY

Method, Variable, and Research Design

This research utilizes the experimental research method (Fraenkel & Wallen, 2008). Independent variable in this research is multimedia. There were two dependent variables on students' motivation and students' critical thinking skills. The research is designed with Quasi-Experimental – The One Group Pretest-Posttest Design.
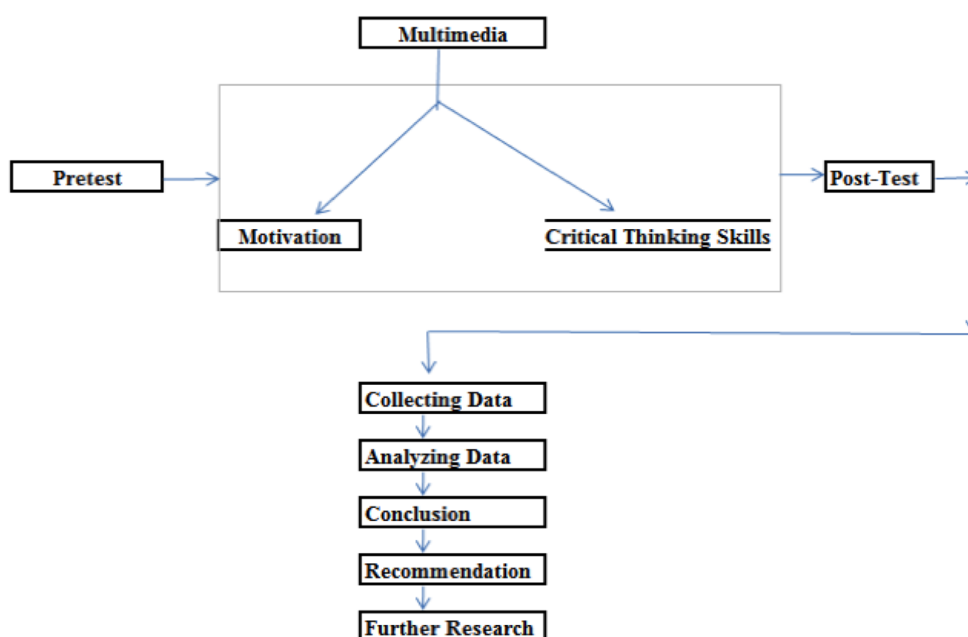
Subjects, Location, and Research Timing

The population of this research was the second semester students in Grade VIII at Mahatma Gading School. The total number of students were 67 that consist of 35 boys and 32 girls. The research was conducted in Mahatma Gading School at North Jakarta from February 8 to March 30 (2016).

Research Instruments

To collect the data and finally to answer the research questions, three research instruments were used namely science test to measure students' critical thinking skills scales, learning styles scales and motivation scales to measure students before and after the learning took place.

Table 2. Research Instruments and Data Collection

No	Research Question	Research Instrument and Data Collection	Data Source
1	Does implementing multimedia in teaching improve students' motivation based on students learning styles	Questionnaire for Pretest and Post-test (Written test)	Grade VIII Respondent
2	Does implementing multimedia in teaching improve students critical thinking skills based on students learning styles	Questionnaire for Pretest and Post-test (Written ten)	Grade VIII Respondent

RESULTS AND DISCUSSIONS

The main Instrument is the pretest and posttest containing of 30 statements for motivation in the form of questionnaire with Likert 1-5 scales. Validity test of every statement item in the questionnaire was done through correlation technique form Pearson Product Moment. Reliability test was done through Alpha Cronbach.

Table 3. Cornbach Alpha Test on Motivation

Motivation	Cornbach's Alpha	Cornbach's Alpha Based on Standard Items	N of Items
Pretest	.764	.773	30
Posttest	.763	.819	

Several indicators examples from motivation variables are curiosity, discipline reward and achievement.

Descriptive statistic on motivation shows difference in the average value of pretest and post-test. The average posttest was 97.04 and the average value of pretest was 94.82, there is an increase in motivation post-test. The difference between the mean posttest and the mean pretest was 2.22.

Table 4. Motivation Score Before and After The Treatment

Motivation	N	Mean	Std. Deviation
Pretest	67	94.82	13.29
Post-test	67	97.04	10.96

Pretest and posttest can be analyzed using matched pairs statistical test or signed rank test (Sugiyono, 2015, pp. 24–27). Wilcoxon test that was done used the below provisions:

Table 5. Hypothesis Test for Motivation Using Wilcoxon

Hypothesis		Criteria
There were significant differences in students' motivation before and after implementing multimedia	Ho: t posttest = t pretest Ha: t posttest> t pretest	Ho rejected or accepted if p-value ≤ 0,05 (1 tailed test, Sig/2)

Source: Pramesti (2014)

1. H_{01}: There are no significant differences in motivation before and after treatment.
   $H_{01-1:}$ There are no significant differences with motivation before and after treatment for students with visual learning style.
   H_{01-2}: There are no significant differences with motivation before and after treatment for students with auditory learning style.
   H_{01-3}: There are no significant differences with motivation before and after treatment for students with reading learning style.
   H_{01-4}: There are significant differences with motivation before and after treatment for students with kinesthetic learning style.
2. $H_{a1:}$ There are significant differences in the motivation before and after treatment.
   $H_{a1-1:}$ There are significant differences in motivation before and after treatment for students with visual learning style.

H_{a1-2}: There are significant differences in motivation before and after treatment for children with auditory learning style.

H_{a1-3}: There are significant differences in motivation before and after treatment for children with reading learning style.

H_{a1-4}: There are significant differences in motivation before and after treatment for children with kinesthetic learning style.

The summary of Wilcoxon pretest – posttest for visual, auditory, reading and kinesthetic. The Wilcoxon Sig (2 tailed) for visual was 0.000, auditory was 0.024 and kinesthetic was 0.017 which is less than 0.05 Ho is rejected in other words, there is significant differences in motivation. The Wilcoxon test on reading Asymp.Sig (2-tailed) showed 0.221, Ho accepted in other words there is no significant differences in motivation.

The second instrument was students' critical thinking skills based on Bloom et al. (1984). The categories were knowledge, comprehension, application, analysis, synthesis and evaluation. The researcher made ten multiple choices on respiratory system to measure their cognitive in Bloom Taxonomy, C1 is about the knowledge, C2 is about comprehension interpretation, C3 is about application, C4 is about analysis, C5 is about synthesis and C6 is about evaluation on the respiratory system. Lastly post test was conducted to test students' ability in thinking critically. The results of the test were then gathered together in a table. The data collected from the post test was compared with the pretest result and analyzed in order for the researcher to find that the participants get better scores and can think critically.

The descriptive statistics of the science pretest and posttest. Included in the data analyses were mean and standard deviation. The science pretest mean 24.37 (S.D = 0.599) and science post-test mean 24.85 (S.D = 0.925). The result shows slightly in low categories was recorded by science post-test and a significant differences teaching using multimedia. The result shows the positive impact of learning through multimedia, which can be considered as effective.

Table 6. Descriptive Statistics Critical Thinking Skills Pretest and Posttest

Science	N	Mean	Std. Deviation
Pretest	67	24.37	0.599
Post-test	67	24.85	0.925

Source: Result of Data Processing, 2016

Pretest and posttest can be analyzed using Wilcoxon matched pairs statistical test or signed rank test (Sugiyono, 2015, pp. 24–27). Wilcoxon test that was done used the below provisions:

Table 7. Hypothesis Test for Critical Thinking Skills Using Wilcoxon

Hypothesis		Criteria
There were significant differences in students' critical thinking skills before and after implementing multimedia	Ho: t posttest = t pretest Ha: t posttest> t pretest	Ho rejected or accepted if p-value ≤ 0,05 (1 tailed test, Sig/2)

Source: Pramesti (2014)

1. H_{02}: There are no significant differences in students' critical thinking skills before and after treatment.

H_{02-1}: There are no significant differences in students' critical thinking skills before and after treatment for children with visual learning style.

H_{02-2}: There are no significant differences with critical thinking before and after treatment for children with auditory learning style.

H_{02-3}: There are no significant differences with critical thinking before and after treatment for children with reading learning style.

H_{02-4}: There are no significant differences with critical thinking before and after treatment for children with kinesthetic learning style.

2. H_{a2}: There are significant differences in the "critical thinking" before and after treatment.

H_{a2-1}: There are significant differences in critical thinking before and after treatment for children with visual learning style.

H_{a2-2}: There were significant differences in critical thinking before and after treatment for children with auditory learning style.

H_{a2-3}: There were significant differences in critical thinking before and after treatment for children with reading learning style.

H_{a2-4}: There were significant differences in critical thinking before and after treatment for children with kinesthetic learning style.

The Wilcoxon test Asymp (2- tailed) showed there is significant differences in critical thinking skills for visual (0.003) learning style, auditory learning style (0.003) and kinesthetic (0.001). There is no significant difference in critical thinking skills in reading learning style (0.072).

Table 8. Wilcoxon Test on Students' Critical Thinking Skills based on Learning Styles

Learning Styles	Respondents	Sig. (2-tailed)	Sig. (2-tailed) $P < 0.05$ (rejected) $P > 0.05$ (accepted)	Interpretation
Visual	25	0.003	Ho is rejected	There is significant differences in motivation
Auditory	14	0.003	Ho is rejected	There is significant differences in motivation
Reading	13	0.072	Ho is accepted	There is no significant differences in motivation
Kinesthetic	15	0.001	Ho is rejected	There is significant differences in motivation

Source: Result of Data Processing, 2016

The third instrument learning style according to Leite, Svinicki, and Shi (2009) data were analyzed by calculating the total value of each category of learning styles. The highest value obtained in one of the categories of students learning style, is regarded as the learning style of the student. Find the least and the most of each learning styles and is considered as the students learning style.

Table 9. Students' Learning Styles

Visual	Auditory	Reading	Kinesthetic	Total
25	14	13	15	67

CONCLUSIONS

Based on the result of data analysis and discussion conducted in this study we conclude

that:

1. The implementation of multimedia in teaching does not state any improvement in students' motivation. It was observed that the results showed no significant value towards students of grade VIII at Mahatma Gading, who possess reading learning style. On the other hand, students of grade VIII in critical thinking skills at Mahatma Gading School possess visual, auditory, and kinesthetic learning style, which is observed in the increase of students' motivation having a significant value.

2. The implementation of multimedia in teaching indicated that there is an improvement in students' critical thinking skills, having a significant value towards grade VIII students in critical thinking skills at Mahatma Gading School who possess visual, auditory, kinesthetic learning styles. On the other hand, students of grade VIII in critical thinking skills at Mahatma Gading School who possess reading learning style reading showed no significant value in critical thinking skills.

Recommendations

Based on the research findings, it is concluded that generally, learning style does not influence academic performance. A student, whether high achieving or low achieving, does not have a clearly defined learning style preference. With this inference, it is recommended that seminars and trainings be conducted to acquaint teachers on the various learning styles. Moreover, in designing teaching plans and strategies, the teacher should consider how the different learning styles under the Fleming's model can be incorporated in the teaching-learning process. Students must also provide input as to their preferred learning style to be considered by the teacher in designing the course syllabus.

1. Recommendation for school

   In the beginning of the academic term, it is recommended for the teachers or supervisors to conduct a test for students to know their learning styles. This would therefore enable teachers to prepare appropriate lesson plans or state a clear form of job description for teachers. Schools should organize trainings, workshops and seminars for teachers to make use of multimedia during lessons, so that teachers become more creative in the teaching and learning process in classrooms. The curriculum designers should consider the variety of students' learning styles. Teachers' awareness of using a variety of teaching methods suited to the different students' learning styles.

2. Recommendation for teachers

   Due to the proof that multimedia improves students' motivation and critical thinking skills for students who possess visual, auditory, and kinesthetic learning styles, teachers should be more dedicated to lesson plan in accordance to the materials by presenting lessons using a power point. Power point should include more pictures and less text. The size of the font should also be reconsidered in the preparation of the power point. It is advisable to give more examples and various kinds of animations to preserve students' attention span. Teachers can also present lessons by showing movies to facilitate the lesson. PowerPoint with animation and pictures in the science classes should be advisable and it was proven to improve academic results. Since the motivation scales do not have the power to investigate students' motivation thoroughly, in depth observation could serve as more accurate data collecting instruments to analyze their academic result. Completing the method not only using quantitative approach, but also using qualitative approach to explore more of the phenomenon happening in the classroom and address the research problems at the deeper levels. Reading learners comprehend and remember what they read, and they often enjoy writing. Classes have traditionally been geared to the reading learning style; these learners can take notes in most classes and will benefit from reading them as a method for study. Due to this, to overcome this problem for students having reading learning styles, it is

advisable for students to practice note-taking and given a chance to explain their notes in front of the class. This would benefit students having reading learning styles in a way that they will be able to learn better in a classroom using power point as a teaching media conducted in classrooms. We can also advise teachers to make use of colored pens and highlighters which would enable students to focus on the key ideas of the concepts taught in classrooms using power point as a teaching media. On the other hand, teachers can also summarize the materials taught in a written form so students having reading learning styles can read. In slides presented in power point presentations, teachers are advised to write key concepts and ideas in short explanations, such as diagrams, charts, and graphs. Therefore, this would also help students having reading learning styles. Nevertheless, power point can increase student's motivation and critical thinkinsg; the author realizes that there is no single teaching method that can assure that the student receives all the materials that they need to know. Furthermore, the author also realizes that many other teaching methods undergo the same process, but are not reached out in this research.

REFERENSI

Arifah, A., & Norizan, M. (2008). Using Teaching Courseware to Enhance Classroom Interaction as A Method of Knowledge Sharing. *Journal of Information Systems, Research & Practices, 1*(1).

Bloom, B. S., Engelhart, M. D., Furst, E. J., Hill., W. H., & Krathwohl, D. R. (1984). *Taxonomy of educational objectives.* David McKay Company, Inc.

Ding, X., Liu, J. (2012). Advantages And Disadvantages of Powerpoint in Lectures to Science Students. *International Journal of Education and Management Engineering, 2*(9)*,* 61–65. https://doi.org/10.5815/ijeme.2012.09.10

Dörnyei, Z., Ushioda, E. (2011). *Teaching and Researching Motivation.* Pearson Education Limited.

Dunn, R., & Griggs, S. A. (2000). *Practical approaches to using learning styles in higher education.* Bergin & Garvey.

Erdemir, N. (2011). The effect of PowerPoint and traditional lectures on students' achievement in physics university. *Journal of Turkish Science Education (TUSED), 8*(3), 176–189.

Fisher, A. (2009). *Critical Thinking: An Introduction.* Cambridge University Press.

Fraenkel, J. P., & Wallen, N. E. (2008). *How to design and evaluate research in education.* McGraw-Hill Companies, Inc.

Ghaedi, G., & Jam, B. (2014). Relationships between learning style and motivation for higher education in EFL students. *Theory and Practice in Language Studies, 4*(6), 1232–1237. https://doi.org/10.4304/tpls.4.6.1232-1237

Gottfried, A. E. (1990). Academic Intrinsic Motivation in Young Elementary School Children. *Journal of Educational Psychology, 82*(3), 525–538. https://doi.org/10.1037/0022-0663.82.3.525

Hawk, T. F., Shah, A. J. (2007). Using Learning Style Instruments to Enhance Student Learning. *Decision Sciences Journal of Innovative Education, 5*(1), 1–19. https://doi.org/10.1111/j.1540-4609.2007.00125.x

Hepner, M. R. (2011). *Developing Student Critical Thinking Skills as A Community College Adjunct Instructor*. Academia.

https://www.academia.edu/1144987/Developing_Student_Critical_Thinking_Skills_as_a_Community_College_Adjunct_Instructor

Lai, E. R. (2011). Motivation: A literature review. Pearson.

Leite, W. L., Svinicki, M., Shi, Y. (2009). Attempted validation of the scores of the VARK: Learning styles inventory with multitrait-multimethod confirmatory factor analysis models. *Educational and Psychological Measurement, 70*(2), 323–339. https://doi.org/10.1177/0013164409344507

Marcy, V. (2001). Adult learning styles: How the VARK learning style inventory can be used to improve student learning. *The Journal of Physician Assistant Programs, 12*(2), 117–120. http://doi.org/10.1097/01367895-200107000-00007

Mayer, R. E. (2005). Cognitive theory of multimedia learning. In R.E. Mayer (Ed.), *The Cambridge handbook of multimedia learning* (pp. 31–48). Cambridge University Press. https://doi.org/10.1017/CBO9780511816819.004

Moss, C. M., & Brookhart, S. M. (2012). *Learning Targets: Helping Students AimfFor Understanding in Today's Lesson.* Alexandria.

Noordin, S., Ahmad, W. F. W., & Hooi, Y. K. (2011). Study of effectiveness and usability of multimedia courseware integrated with 3-dimensional model as a teaching aid. *International Journal of Computer Applications, 16*(4), 20–27. https://doi.org/10.5120/2001-2697

Pramesti, G. (2014). *Kupas tuntas penelitian dengan SPSS 22.* PT Elex Media Komputindo.

Santrock, J. W. (2008). *Psikologi pendidikan.* Prenada Media Group.

Schunk, D. H. (1991). Self-efficacy and academic motivation. *Educational Psychologist, 26,* 207–231.

Sorden, S. D. (2012). The cognitive theory of multimedia learning. In *Handbook of Educational Theories* (pp. 1–31). Information Age Publishing.

Sugiyono. (2015). *Metode penelitian kuantitatif, kualitatif, dan R&D.* ALFABETA.

Surjono, H. D. (2015). The effect of multimedia and learning atyle on student achievement in online electronics course. *The Turkish Online Journal of Educational Technology, 14*(1), 116–122. http://tojet.net/articles/v14i1/14112.pdf

Teoh, B. S. P., & Neo, T. K. (2007). Interactive Multimedia Learning: Students' Attitudes and Learning Impact in An Animation Course. *The Turkish Online Journal of Educational Technology, 6*(4).